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CIRCULAR NO. 9, SECOND SERIES.

United States Department of Agriculture,

DIVISION OF ENTOMOLOGY.

CANKER-WORMS.

GENERAL APPEARANCE AND METHOD OF WORK.

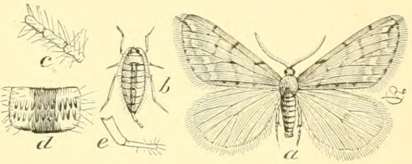

FIG. 1.—*Paleacrita vernata*: *a*, male moth; *b*, female moth—both natural size; *c*, joints of female antenna; *d*, joint of female abdomen; *e*, ovipositor—enlarged. (From Riley.)

Shortly after the apple tree has put forth its leaves in the spring large numbers of a slender, naked span-worm, or measuring worm, sometimes appear upon this and various other kinds and ornamental trees, in the leaves of which they gnaw small holes. As they increase in size, the entire leaf, with the exception of the stout midrib, is devoured. Two different insects are often concerned in this destructive work namely; the fall canker-worm, represented at Figure 4, and the spring canker-worm, shown at Figure 2. The latter will be readily distinguished by possessing only two pairs of legs on the underside of the posterior half of the body, there being three pairs in the species first mentioned. Both are evidently natives of this country, and have never been reported as occurring outside of North America.

THE SPRING CANKER-WORM.

(*Paleacrita vernata* Peck.)

Distribution.—This is the species usually concerned in the widespread defoliation of fruit trees, particularly in the Mississippi valley and throughout the West. It ranges from Maine to Iowa, and southward to Texas, but is more restricted along the Atlantic seaboard, where it has not as yet been reported as occurring south of New Jersey. Owing to the fact that the adult female insects are wingless, the spread of the species is necessarily slow, and is principally accomplished through the medium of nursery stock infested with the insect's eggs.

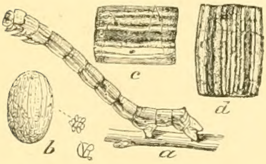

FIG. 2.—*Paleacrita vernata*: *a*, larva—natural size; *b*, eggs—natural size and enlarged; *c*, side view of segment of larva; *d*, dorsal view of same—both enlarged. (From Riley.)

Natural history and habits.—Although the females are wingless, the males are furnished with two pairs of rather large, thin wings; the general color is bluish gray, with light and dark markings, as shown at Figure 1, *a*. Oviposition sometimes occurs during mild winters, but as a general rule not until March or April. The eggs (see Fig. 2, *b*) somewhat resemble in miniature those of a hen and are deposited in irregular masses, usually concealed beneath pieces of loose bark and similar objects. They hatch about the time that the apple tree unfolds its leaves in the spring, the date varying with the locality and season, from the middle of April to the latter part of May. The young canker-worms eat greedily and grow rapidly, usually attaining their full size in from three to four weeks from the time of issuing from the eggs. They then enter the ground to a depth of from two to five inches, according to the character of the soil; here each one forms a small cell, which it lines with a few strands of silk, and shortly afterward transforms to the chrysalis, in which condition it remains until the following winter or early spring, when the change to the adult insect takes place.

Only one generation is produced each year.

NATURAL ENEMIES.

Large numbers of canker-worms normally fall a prey to various kinds of birds and several kinds of beetles feed upon them. Certain kinds of wasps provision their nests with them to serve as food for their young. Ichneumon flies and Tachina flies while in the larva state also destroy many by feeding upon them internally. The eggs are destroyed by mites, and a minute Chalcis fly preys upon them, each egg serving as food for one of the flies. All these checks to the undue increase of the canker-worms when present in any given locality usually succeed in keeping them within due limits, but when these are absent, or the weather conditions are unusually favorable to the increase of the worms, artificial means will be found necessary to keep them in subjection.

REMEDIES AND PREVENTIVE MEASURES.

Owing to the fact that it is only in exceptional years that canker-worms appear in destructive numbers, but little attention is usually paid to them until the blighted appearance of the infested trees proclaims their presence to the orchardist. At such times the damage is already well under way and will be increased somewhat before an insecticide can take effect. As an immediate partial remedy the jarring method may be employed. This consists in first placing a strip of stiff paper around the trunk of the tree, and smearing it with some kind of sticky substance, such as tar, printers' ink, thick molasses, or bird lime, to prevent the worms from again ascending. The tree is then jarred or shaken, causing some of the larvæ to drop to the ground, while others let themselves down by silken threads, which must be severed by means of a cane or stick, to prevent the worms from reascending the tree.

A general spraying with arsenicals as soon as the worms appear will rid the trees of these pests in a very short time. Paris green is the more satisfactory of the arsenicals, as it is less liable to injure the foliage than London purple, and its use has proven safe and effective at the rate of one pound to 150 gallons of water. Before mixing the Paris green with water it is advisable to add an equal weight of freshly slaked lime, mixing thoroughly. The lime takes up any free arsenic, and prevents possible injury to the foliage. During the process of applying the poison, which can be best accomplished by means of an ordinary spray pump and nozzle, the solution should be kept constantly stirred to prevent the poison from settling to the bottom. The worms are most readily poisoned when newly hatched, and it is therefore very important to spray as soon as the young worms first appear, with the object also of preventing the damage which would result from delay.

After the worms have assumed the chrysalis form just beneath the surface of the ground, large numbers may be destroyed by plowing and harrowing the orchard. This may be done at any time during August or the first half of September.

The principal remedies employed against these pests in the past have had for their object the preventing of the wingless female moths from ascending the trees to deposit their eggs. Various mechanical devices have been used, and these, while troublesome and expensive, and in general superseded by the arsenical treatment, may still be of service in special cases, or where spraying can not well be practiced. One of the simplest devices, and one giving as good satisfaction as any other, consists in surrounding the trunk of each tree with a band of stiff paper. This band should be six or eight inches wide, and its lower edge should rest upon the ground, or be pressed a short distance into it in order to prevent the moths from gaining access to any portion of the tree except by first passing over this band. The adhesive substance should then be applied to the upper portion of it. The moths, finding themselves unable to pass over this barrier, will deposit their eggs on the lower part of it.

The bands should be applied to the trees about the first of March, and the adhesive substance renewed until the trees begin to leaf out, after which the bands should be removed and destroyed. In the matter of applying them the orchardist should be guided by his own observations, since the time of appearance of the moths will vary according to the locality and season.

THE FALL CANKER-WORM.

(*Anisopteryx pometaria* Harr.)

This insect so closely resembles the preceding species as to be often mistaken for it. A careful comparison of the accompanying illustrations, however, will render the separation of the two forms comparatively easy. The habits and natural history of the two species are so nearly identical that for the present purposes it will only be necessary to indicate their principal differences. The fall canker-worm is more essentially a northern insect, occurring from Rhode Island to Canada, and westward to Lake Superior; and quite recently it has been found in large numbers in some of the orchards of northern California. The eggs are deposited principally in late autumn or early winter, although during mild winters egg-laying sometimes continues as late as the month of March. The eggs somewhat resemble miniature flower pots, being small at the lower end, and gradually enlarging to the top, which is quite flat. They are attached to the bark in masses of from sixty to two hundred, placed side by side in exposed situations. Hatching occurs at about the same time as with the preceding species, and the worms attain their full growth and enter the earth at about the same time as the latter, but instead of simply lining their cells with a few strands of silk they spin dense cocoons of a yellowish silk. The change to the chrysalis takes place about one month after the spinning of the cocoons, and the adults issue for the most part from the middle of October to the middle of December, although during mild winters a few issue as late as March.

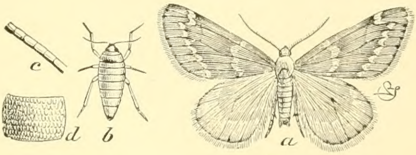

FIG. 3.—*Anisopteryx pometaria: a*, male moth; *b*, female—natural size; *c*, joints of female antenna; *d*, joint of female abdomen—enlarged. (From Riley).

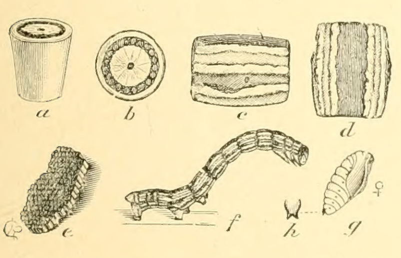

FIG. 4.—*Anisopteryx pometaria: a, b*, egg; *c, d*, side and dorsal views of larval segment—enlarged; *e*, egg-mass; *f*, larva; *g*, female pupa—natural size; *h*, anal tubercle—enlarged. (From Riley.)

Owing to the fact that the chrysalids are inclosed in tough cocoons, plowing the

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soil containing them will produce little or no effect upon the inclosed insects. The arsenicals, notably Paris green, are, as with the former species, the most efficient and economical means of controlling this insect. If it be desirable, however, to proceed against the moths, the barriers applied to the trees for the purpose of preventing the adult insects from ascending and depositing their eggs should be put in place early in October, or before the first moth makes its appearance, and the adhesive substance applied to the bands should be renewed as long as any of the moths are to be found, after which the bands may be removed and destroyed by burning or otherwise. Care should be exercised in removing the bands before the season for the eggs to hatch, otherwise the very object which the bands were intended to accomplish will be defeated.

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Approved:
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